

# Considering Climate Change in Hydropower Relicensing

July 2012

## Fact Sheet

### The Issue

Water is a vital resource needed for many purposes including drinking, manufacturing, and energy production. In California due to climate change, air temperatures are expected to increase, precipitation levels may decrease, and more precipitation would fall as rain instead of snow. These climate transitions will affect the operation of hydropower units used for energy production. Hydropower is an important renewable energy, supplying California 15-20 percent of its total electricity depending on precipitation.

More than 300 hydropower dams in California are regulated by the Federal Energy Regulatory Commission (FERC), and more than half of the permits for these projects will expire by 2020. Currently, FERC is not considering climate change when relicensing hydropower units, stating that there is a lack of scientific information and tools for the needed analyses. However, because of the long life span of a hydropower project's license – 30 to 50 years – the relicensing process is the only time to implement much-needed changes in a project's operation to affect power generation, water quality, ecological health, and recreational functions. There is an opportunity to conduct research to advise future environmental regulatory analyses and, eventually, the development of permit conditions for hydropower units that would provide operational flexibility while minimizing negative environmental impacts.



New Bullards Bar Dam and Reservoir on the North Yuba River.

Source: Yuba County Water Agency

### Project Description

Under this project, researchers are conducting an environmental study on climate change for the Yuba River Development Project, which has a capacity to generate 362 megawatts of electricity. A new license for the project will be filed by 2014 with the potential to last up to 50 years, a time frame in which climate change must be considered. This study will use climate scenarios developed for the California Energy Commission to investigate alternative management scenarios that regulators may consider during the relicensing process. After this project, other hydropower facilities could be addressed in follow-up studies, as needed, to develop the methods and tools for advising relicensing analyses.

The goals of this project are to:

- Develop a hydrologic model linking rainfall runoff data from a climate-driven model with daily project operations including energy production and other human and environmental water use impacts.
- Analyze model results to identify the facilities and operations most vulnerable to climate change impacts.
- Analyze potential effects on the downstream environment due to project operations that were modified to compensate for altered hydrology.

Some of the innovative research approaches to be implemented in this project include:

- Modeling hydropower, water supply, and recreation conditions in weekly time steps instead of the monthly steps used in prior studies.
- Estimation of potential effects on ecology and discharge water temperatures due to increased thermal layering in the reservoirs.

## **PIER Program Objectives and Anticipated Benefits for California**

The energy sector is the main source of greenhouse gas emissions in California, and climate change will substantially affect energy generation and demand. Due to predicted climate change impacts to precipitation, snowpack, and run-off, hydropower operations in California could be greatly affected. This project will provide an example of the tools and methods that the FERC could use in its hydropower re-licensing process. This project will also help ensure that stable, secure, and renewable sources of energy will continue to be provided to California residents.

## **Project Specifics**

Contract Number: 500-10-030

Contractor: UC Davis

City/County: Davis/Yolo

Application: Regional

Amount: \$300,000

Term: February 2011 to August 2013

For more information, please contact:

Guido Franco

California Energy Commission

Public Interest Energy Research Program,  
Environmental Area

Phone: 916-327-2392

E-mail: [Guido.Franco@energy.ca.gov](mailto:Guido.Franco@energy.ca.gov)

Joshua H. Viers

Department of Environmental Science and Policy  
UC Davis

One Shields Avenue

Davis, CA 95616

Phone: 530-341-3367

E-mail: [jhviers@ucdavis.edu](mailto:jhviers@ucdavis.edu)

### **Disclaimer**

The Commission, its employees, and the State of California make no warranty, expressed or implied, and assume no legal liability for this information or the research results.



**Edmund G. Brown Jr., Governor**  
**California Energy Commission**  
Chair Robert B. Weisenmiller, Ph.D.  
Executive Director: Robert P. Oglesby

**California Energy Commission**  
**Public Interest Energy Research**  
1516 Ninth Street  
Sacramento, CA 95814-5512

CEC-500-2012-FS-027